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THE UTILIZATION OF LOGGED-OFF LAND
FOR PASTURE IN WESTERN OREGON
AND WESTERN WASHINGTON.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., June 5, 1911.

SIR: I have the honor to transmit herewith and to recommend for publication as a Farmers' Bulletin a manuscript entitled, "The Utilization of Logged-off Land for Pasture in Western Oregon and Western Washington," prepared jointly by Mr. Byron Hunter, agriculturist, and Mr. Harry Thompson, expert, under the direction of the Agriculturist in Charge of the Office of Farm Management of this Bureau.

Respectfully,

WM. A. TAYLOR,
Acting Chief of Bureau.

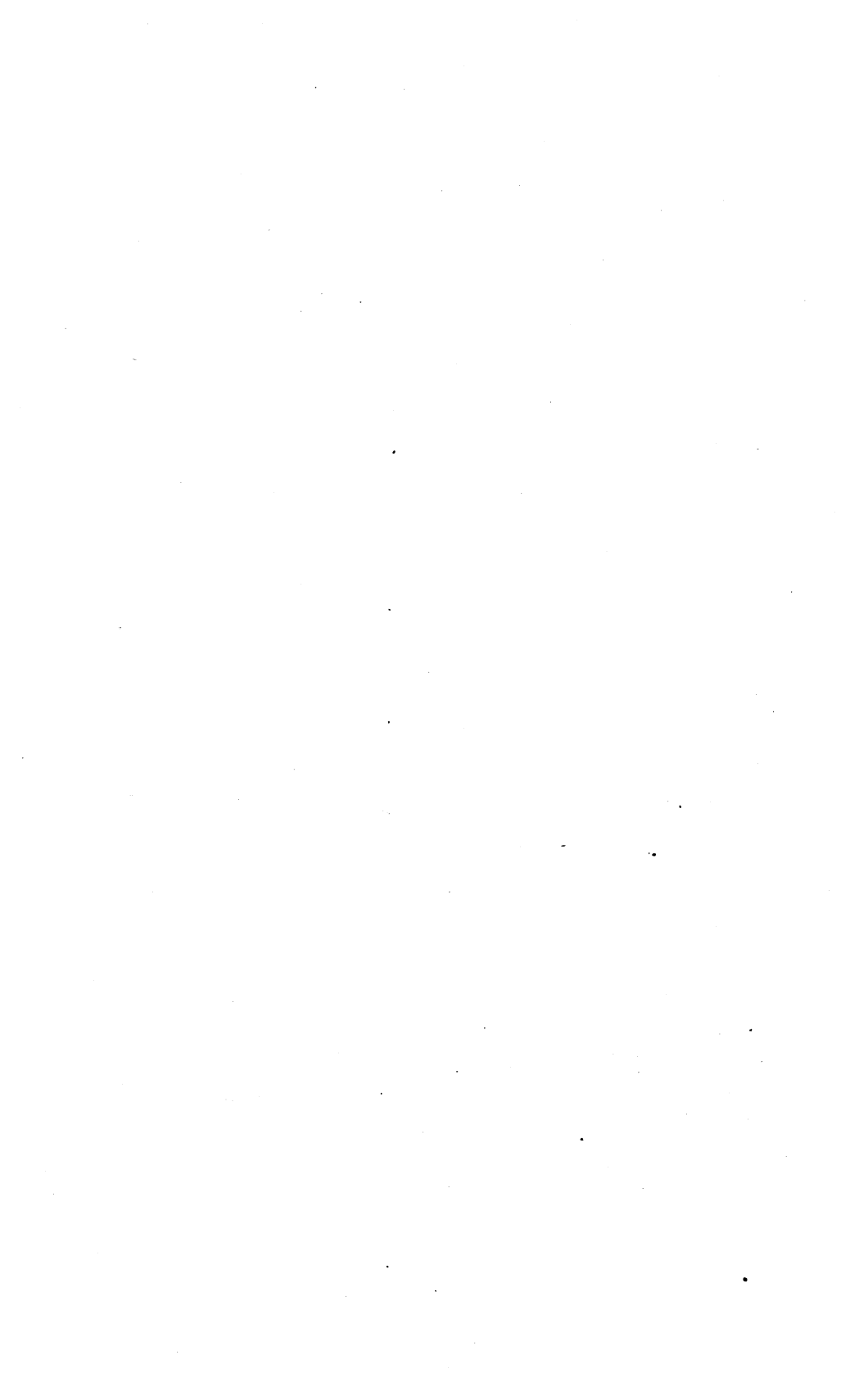
Hon. JAMES WILSON,
Secretary of Agriculture.

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THE UTILIZATION OF LOGGED-OFF LAND FOR PASTURE IN WESTERN OREGON AND WESTERN WASHINGTON.

INTRODUCTION.

Western Oregon and western Washington for the most part are covered with dense forests of evergreen timber. For many years lumbering has been one of the leading industries of these two States. As a consequence the merchantable timber has been stripped from large areas, leaving what is known as "logged-off" or "cut-over" land. As left by the loggers the land is usually thickly studded with stumps of various sizes, among which old logs, tree tops, limbs, small timber, and underbrush are strewn. (See fig. 3.) To bring such land under cultivation is very expensive. In most instances the cost of the raw stump land plus the cost of clearing it exceeds the value of the land after it is under cultivation. For this reason the bulk of the logged-off land has been permitted to lie unimproved and unused since the timber was removed. In the meantime it has grown up to ferns, underbrush, and thickets of young evergreens. (Figs. 1 and 2.) In this condition cut-over land yields nothing to the owner and becomes a drawback to the community. During the summer months, when the logs, tree tops, and other rubbish on the surface of the ground become thoroughly dry, uncontrollable fires not infrequently sweep over these waste areas. In this way the logged-off land may become a menace to the adjacent standing timber and to the homes and property of the settlers who are making farms of these lands.

EXTENT OF LOGGED-OFF LAND.

At the present time there are approximately 3,000,000 acres of unimproved logged-off land in western Oregon and western Washington. The area of land of this description is also increasing very rapidly. In 1908 the 19 counties of Washington west of the Cascade Mountains had, in round numbers, a total area of 5,180,000 acres of standing timber. By 1910 this was reduced to 4,450,000 acres; a decrease of 365,000 acres per annum. A decrease in the area of standing timber means a corresponding increase in the area of logged-off land.

Logged-off land is being cleared and brought under cultivation very slowly when compared with the area stripped of its merchantable timber. In 1908 these 19 counties of western Washington had 432,000 acres of assessed cultivated or improved pasture land. This had increased by 1910 to 628,000 acres, an increase of approximately 98,000 acres per year. From these figures it will be seen, therefore, that the area stripped of its merchantable timber in western Washington exceeds that cleared and improved for pasture by 267,000 acres per year.



FIG. 1.—Logged-off land, showing its condition when used for pasture and the second growth produced when allowed to lie unused. The merchantable timber was removed from the land on each side of the fence during 1902. In the fall of 1905 the land was burned over. Orchard grass was sown in the ashes on the right side of the fence, but not on the left. Since the spring of 1904 the land to the right of the fence has been pastured with Angora goats, cattle, and horses. From a glance at the picture it will be seen that the cost of clearing the land that has been pastured would be much less than the cost of clearing that which has not been pastured.

UTILIZATION OF LOGGED-OFF LAND.

The rapid increase in population of both Oregon and Washington during the last decade has created a great demand for farm produce. To meet this it has been necessary to ship into these two States enormous quantities of food supplies. This necessity in turn has made a great market for farm land and has brought the question of utilizing logged-off land prominently before the people. In spite of the high cost of clearing cut-over land the great demand for farm produce is causing the fertile creek and river bottoms and much of the bench

land adjacent to the cities and transportation points to be cleared and devoted to market gardening, truck farming, dairying, poultry raising, fruit growing, and general farming.

As the merchantable timber becomes scarcer and logging operations are crowded farther and farther back into the mountains, large areas of very rough land will be logged over. Perhaps the most satisfactory way to use such land is to burn it over after the merchantable timber is removed and then allow it to reforest itself.



FIG. 2.—Logged-off pasture land that lay idle for eight years before being converted into pasture. The land on each side of the fence was logged over in 1895. A second growth of young trees and brush was permitted to spring up during the next few years. The second growth on the left of the fence was slashed (cut down) in the spring of 1903. During the following September the slashing was burned and 10 pounds of orchard grass seed per acre were sown in the ashes. Since the spring of 1904 the pasture has been grazed with Angora goats, cattle, and horses. The underbrush and young trees on the right of the fence represent a growth of 15 years. It will be clearly seen that the land on the left of the fence, which has been used for pasture for seven years, can be cleared and brought under cultivation much more cheaply than that on the right side of the fence.

Steep hillsides are also to be found here and there throughout the logged-off areas which should be reforested. In future years when all of the cut-over land that is suitable for cultivation has been cleared, these steep hillsides, if allowed to produce a growth of evergreens, will not only be valuable for the timber produced but will add much to the attractiveness of the country.

Between the land that is now being cleared and brought under cultivation and the rough land that should be reforested lies the bulk

of the present and future logged-off land. Eventually the most of this will doubtless be cleared and cultivated. Owing to the rapidity with which the timber is being cut and the slowness with which the logged-off lands are being cleared, it is very evident that it will be many years before the bulk of this land will be brought under cultivation. If allowed to lie unused it produces a growth of underbrush and evergreens. It therefore becomes more difficult to clear the land as the years go by.

The climate of western Oregon and western Washington is well adapted to the growing of grass and clover, and the primary object



FIG. 3.—Burned-over logged-off land, showing the débris left by the loggers and the fire. The merchantable timber was removed during March and April, 1910. In July the land was burned over.

of this bulletin is to show (1) how these logged-off lands may profitably be used for pasture and (2) how, under proper management, this use will materially reduce the cost of clearing the land and decrease the danger of forest fires.

PREPARATION OF LOGGED-OFF LAND FOR PASTURE.

Under the usual modern methods of logging an enormous quantity of débris is left on the surface of the ground, in which fires frequently break out during the dry season. In order to protect the standing timber, it has become quite generally recognized that logged-off land

should be burned over when the conditions are such that the fire can be kept under control. A typical area exemplifying the débris that is left after the land has been burned over is shown in figure 3.

TIME TO BURN.

Considerable difference of opinion exists regarding the most desirable time to burn. On the one hand the timbermen, who look largely to the protection of the standing timber, generally favor burning about the first of October or during May, i. e., at a time when fire will not run in the standing timber. While burning during the late fall or spring affords considerable protection from forest fires, it is well understood that a thorough, complete burn is seldom possible at that time. On the other hand, those who intend to clear the land or improve it for pasture almost universally favor burning during the last of August or early in September, just before the fall rains begin. At this season of the year everything is dry, and the fire consumes the greatest possible quantity of the coarse material. The fire also runs in the fine material lying on the surface of the ground, burns over the greatest possible area, and leaves a bed of ashes in which the grass seed may be sown. An excellent bed of ashes is shown in figure 4. If the land is burned over during the dry season it is necessary to obtain a permit from the State fire warden and to use much greater precaution for keeping the fire under control.

PREPARING FOR THE BURNING.

In order to get the greatest amount of pasture from logged-off land it is sometimes necessary to slash (cut down) the second growth of timber and brush that springs up after the logging. This second growth is shown in figures 1, 2, and 4. While evergreens may be slashed at any time during the year, deciduous trees and saplings should be cut in the late spring or early summer, when the leaves are out and the sap is flowing. If cut at this season of the year more of the roots will die and rot out. The slashing should be done early enough to give the brush time to dry. In order to get it to lie closely together and make the hottest fire when burned, the trees and brush should be felled in the same direction as nearly as possible. Cutting the large limbs from the tree tops left by the loggers will also aid in getting a complete burn. If the large and partly decayed logs are bored, split with a small charge of powder, and allowed to dry for several weeks they will be more nearly consumed by the fire. To guard against the fire being carried by the wind, the old dead trees and snags should be cut down. While this preparation for the burn is necessary in order to get the greatest quantity of feed from the pasture, some men claim it will not pay to do any slashing between the

cessation of logging and the time of the burn. This is a matter that must be decided by each individual.

Since the land to be burned over is to be used for pasture, it will be necessary to fence it. If a fence row 10 or 12 feet wide is cleared around the margin of the area to be burned over, it will greatly help in controlling the fire. It will also make it much easier to keep the fence in repair when the land is inclosed. As a further precaution, several barrels of water may be hauled and placed at points where the fire is likely to be difficult to control.

TIME TO SET THE FIRE.

The velocity of the wind is usually highest from 10 a. m. to 5 p. m. The safest time to start the fire, therefore, is in the late afternoon or after the sun has gone down. It is safest to back-fire, that is, to start the fire on the side toward which the wind is likely to blow, forcing it to burn against the wind.

If logged-off land is burned over as indicated above—just before the fall rains begin—the ground is usually left in good condition for seeding. If the burn takes place during October or in the late spring, the fine trash on the surface of the ground is usually too wet to burn sufficiently to give a good stand of grass. The surface of the ground must be completely burned over and covered with ashes in order that the seed may germinate well. Figure 4 shows how completely the land may be burned over.

PASTURE PLANTS.

Since the stumps and the unburned tree tops in most instances will remain on the land for several years, there will be little opportunity to renew the stand of grass. For this reason great care should be exercised in selecting the seed for the pasture mixture. The ground will be occupied either by the grasses sown or by weeds. It is evident, then, that a part of the mixture should consist of plants which will start easily, make a rapid growth, and occupy the ground quickly. An excellent stand of grass on logged-off land is shown in figure 5. Because of the difficulty in renewing the stand it is also essential that the mixture contain plants which will last a long time, stand trampling and close cropping, and yet produce as much growth as possible. As a guide in making up the mixture, a brief description of the leading pasture plants is here given.

TIMOTHY.

Timothy is one of the most widely grown grasses in western Oregon and western Washington. The seed is cheap, has a very high percentage of germination, and usually gives a good stand if it has been properly sown. It thrives best on moist soil, not being well adapted

to either very wet or very dry conditions. Timothy is an excellent grass to sow in temporary pasture mixtures and to occupy the ground for two or three years in permanent pastures. It should form only a part of the mixture on logged-off land, for it will gradually disappear and give way to weeds or more persistent, longer lived pasture plants. When sown alone, from 6 to 12 pounds of seed per acre are sufficient.

ORCHARD GRASS.

Orchard grass thrives remarkably well on most soils west of the Cascade Mountains and has given excellent satisfaction with those who have tried it as a pasture grass on logged-off land. It is one of



FIG. 4.—A good bed of ashes in which to sow grass seed; the result of slashing and burning a growth of brush 20 years old. The second growth is shown at the right.

the first grasses to begin growth in the spring, remains green well during the summer, makes a good growth during the fall, and thrives under the semishade of open woods better than most other grasses. It revives quickly after it is cropped by stock, stands grazing and trampling much better than timothy, produces a large number of basal leaves, and is one of the long-lived grasses. Orchard grass is relished fairly well by all kinds of stock until the stems begin to mature, when they get coarse and woody. While it is eminently adapted for grazing, it should form only a part of the pasture mixture because it grows in bunches and does not occupy all the ground. From 20 to 25 pounds of seed per acre are used when sown alone.

ITALIAN RYE-GRASS.

Italian rye-grass is well adapted to the climatic conditions of the Pacific coast west of the Cascade Mountains. This is clearly shown by the rapidity with which it has spread over this region during the last few years. The seed of this grass is usually of good quality. It germinates well and the plants make a rapid growth from the seed in the fall of the year. One of its chief points of value is the rapidity with which it occupies the land and shuts out weeds. It also is one of the first of the grasses to begin growth in the spring and one of the last to stop growing in the fall. While it does not grow very tall, it makes considerable forage, owing to its dense basal foliage. It forms a close sod and stands cropping and trampling well. It is very palatable and stock prefer it to most other grasses. Under dry conditions Italian rye-grass is considered short lived, but in the moist climate west of the Cascade Mountains it is very tenacious and maintains itself remarkably well, except on the drier soils.

Italian rye-grass is very much like English rye-grass, from which it may be distinguished by the short beards on its spikelets. It also makes a quicker, larger, and more vigorous growth than English rye-grass. While Italian rye-grass may be grown under a wide range of conditions, it does best on moist, fertile soil. From 25 to 40 pounds of seed per acre are used when sown alone.

KENTUCKY BLUEGRASS.

Kentucky bluegrass is one of the best known permanent pasture grasses in the United States. It has creeping rootstocks which fill the surface soil and form a close, dense turf when the grass has become well established. Its density of sod makes it a desirable grass to sow on steep hillsides where the trampling of the stock will be severe. Bluegrass is very slow in establishing itself, and it usually requires three or more years to take possession of the land. For this reason such grasses as Italian rye-grass, timothy, and clover should always be sown with it. It is one of the few pasture grasses, however, that improves with age. Bluegrass is not adapted to very wet or to very dry soils. It makes a good growth in the spring and fall after the autumn rains begin, but it is practically dormant during the dry summer unless grown on moist soil. Owing to its means of spreading by rootstocks, close grazing when the plants are young does not injure Kentucky bluegrass as much as it does many other grasses. Its palatability, its longevity, its tenacious hold upon the soil, and its close, dense turf make it a very desirable grass to sow on logged-off land when it is known that the land will not be cleared for many years.

REDTOP.

Redtop is well adapted to poorly drained soils. It thrives on land that is too wet for timothy and Kentucky bluegrass. Although it is probably as little relished by stock as any of the pasture grasses, it should form an important part of the pasture mixture for extremely wet land. Since it has the habit of spreading by underground stems or stolons, it forms a firm sod that bears grazing and trampling well. Redtop is a very tenacious, hardy, long-lived grass when grown under conditions suited to it. The seed of redtop is sold in two forms, in the chaff and as recleaned seed. The recleaned seed has most of the chaff taken out. When sown alone, from 10 to 20 pounds of clean seed are used per acre. When the seed is in the chaff about twice this quantity must be used.

RED CLOVER.

West of the Cascade Mountains red clover thrives best on the rich, well-drained upland soils. It begins to grow in the early spring and furnishes the maximum quantity of forage during the late spring and early summer. Unless grown on moist soil its growth is retarded by the dry summer season. It begins to grow again with the coming of the autumn rains and generally furnishes excellent feed until December. In parts of western Oregon and western Washington red clover frequently runs out in a short time. This is largely due to the work of the clover root-borer, an insect that works in and destroys the roots of the plants. While the seed germinates well and it is comparatively easy to get a good stand under favorable conditions, red clover should be sown with the expectation of its lasting for only two or three years. When sown alone, from 8 to 12 pounds of seed are used per acre.

ALSIKE CLOVER.

Alsike clover is best adapted to soils which remain moist during the summer months. It grows very successfully on land that is too wet for red clover. In fact, it is capable of enduring a great deal of flooding, especially if the water is moving. While alsike also disappears in a few years unless reseeded, it is hardier, less susceptible to the attacks of the clover root-borer, and longer lived than red clover. Its chief place of usefulness in pasture mixtures on logged-off lands is on the very moist or wet soils. The seed of alsike clover is quite small, and 5 to 6 pounds per acre are generally used when sown alone.

WHITE CLOVER.

White clover is one of our most valuable pasture plants. It does best on moist soil west of the Cascade Mountains, but grows under almost all conditions, wet or dry, shade or sunshine. It is very easy

to start and, unlike other clovers, is long lived. Although seldom sown alone, except on lawns, it is widely distributed throughout western Oregon and western Washington. The stems of white clover are inclined to be recumbent, often lying prostrate on the ground. At frequent intervals roots are produced on the stems when they are in contact with the soil. Owing to its creeping, prostrate habit, white clover forms a pretty close sod and is therefore well adapted to sow with plants like orchard grass, which grows in bunches. The seed is small; if sown alone, from 5 to 6 pounds per acre are sufficient. Because of the desirability of having a clover in the pasture and because of its longevity and ability to stand close grazing and trampling, white clover should form a part of every permanent pasture mixture.

PASTURE MIXTURES.

The plants which make up the pasture mixture should be determined very largely (1) by the condition of the soil; that is, whether it is wet, moist, or well drained, and (2) by the life of the pasture, whether permanent or temporary. The following mixtures are suggested. The numbers indicate the quantity of seed in pounds to the acre for each kind of grass in the mixture.

Mixtures of pasture grasses suggested for different types of land, showing the number of pounds of seed to the acre for each kind of grass in each mixture.

For wet land.	For moist land.	For upland.	
		Permanent.	Temporary.
Italian rye-grass, 8. Redtop, 4. Timothy, 3. Alsike clover, 3. White clover, 1.	Italian rye-grass, 6. Orchard grass, 4. Kentucky bluegrass, 4. Timothy, 2. Red clover, 4. White clover, 1.	Italian rye-grass, 8. Orchard grass, 5. Kentucky bluegrass, 4. Red clover, 4. White clover, 1.	Italian rye-grass, 8. Timothy, 3. Orchard grass, 5. Red clover, 5. White clover, 1.

Since Italian rye-grass, timothy, and alsike clover are all quick-growing plants, they will form the principal forage on wet land for the first few years. If not reseeded, alsike clover will disappear in three or four years and the timothy will gradually become thinner. Redtop, white clover, and Italian rye-grass will eventually form the chief herbage. A good stand of grass on logged-off land is shown in figure 5.

In the mixture for moist land Italian rye-grass, timothy, and red clover furnish the bulk of the feed for a few years, after which the timothy and red clover will disappear. Orchard grass, Kentucky bluegrass, and white clover will gradually gain possession of the land and furnish the larger part of the forage.

The permanent mixture for upland is intended for areas that will not be cleared for many years. Red clover and Italian rye-grass are the quick growers of this mixture, while orchard grass, Kentucky bluegrass, and white clover are the enduring, long-lived plants. White clover and Kentucky bluegrass will form a good turf that will stand much trampling and close cropping. Red clover will soon disappear, and for this reason many would omit it from the mixture. However, the abundant growth it makes for two or more years should be ample reason for sowing it. White clover will usually come of its own accord in a few years, and many who have had experience with

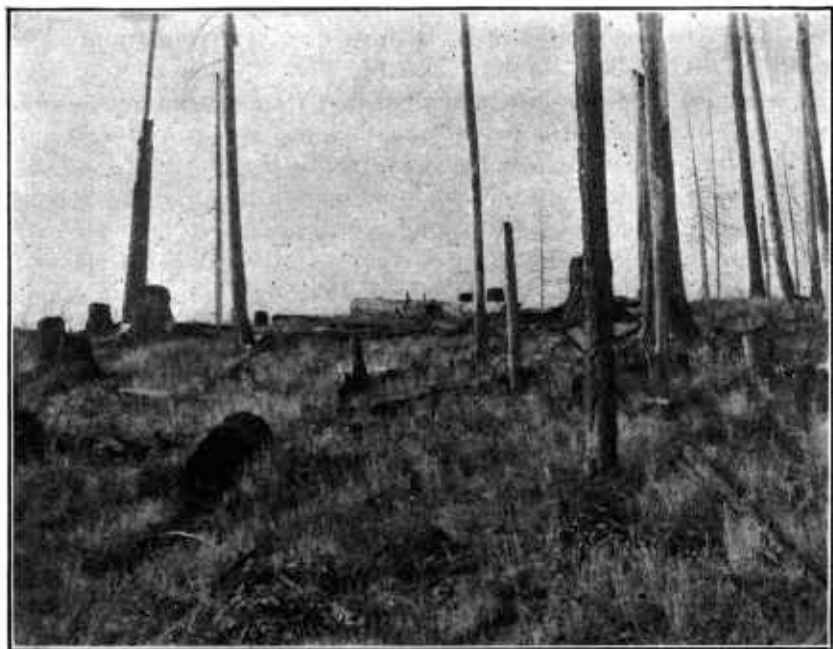


FIG. 5.—A good stand of grass, the result of sowing seed in the unsettled ashes. This land was burned over during the summer of 1909 and seeded that fall. The grass in the foreground is mostly Italian rye-grass.

logged-off land think it unnecessary to add it to the mixture. The importance of having a clover well distributed over the pasture, however, should justify sowing a small quantity of white clover seed.

The temporary mixture for upland is intended for areas that will be pastured with Angora goats for a few years to kill the brush before the land is cleared. Since it will require four to eight years to destroy the brush and rot the roots enough to permit plowing the land, it is necessary to place orchard grass and white clover in the mixture.

Of the grasses here recommended, Italian rye-grass and orchard grass are very popular with those who have tried them. Dr. D. F.

Francis, manager of the Chehalis River Lumber Co., has been seeding logged-off land for eight years. He has tested most of the common grasses and clovers and now has 1,700 acres seeded. He recommends Italian rye-grass, orchard grass, and white clover for the uplands and Italian rye-grass, redtop, and white clover for the wet soils.

WHEN TO SOW THE SEED.

The time of seeding will depend upon when the land is burned over. If the burn occurs during July, August, or early in September the seed should be sown in the early fall before the ashes have been settled by the rains. If seeded in the unsettled ashes, the first rains that come will cover the seed sufficiently to insure good germination. This usually gives excellent results. (See fig. 5.)

If the burn occurs so late in the fall that the seed can not be sown until during October, it is best to sow the grasses then and wait until in February or March to sow the clover. The heaving of the soil during the late fall and winter, a condition caused by alternate thawing and freezing, often destroys young clover unless it is sown early enough in the fall to get a good start. If the fall-sown clover is destroyed in this way it may be reseeded during February or March. When sown in the early spring the heaving of the soil helps to cover the seed.

MANAGEMENT OF THE PASTURE.

Because of the difficulty of renewing or improving the stand of grass, logged-off pasture land should be so carefully managed that it will remain in a high state of productiveness for many years. The pasture should not be closely grazed for at least two reasons. In the first place, live stock do poorly when the feed becomes scarce, and unless thrifty are seldom profitable. In the second place, close grazing materially lessens the quantity of feed produced and shortens the life of the pasture. Pasture plants must be allowed to produce plenty of green leaves if they are to be strong and vigorous, for the green leaves have been rightly styled the "digestive organs of the plant." Close grazing weakens and finally destroys the most of our pasture plants and gives weeds a chance to come in and occupy the ground. It is apparent, then, that pastures should be allowed to get a good start before the stock are turned in. Especially is this true if the pasture is new. Land that is sown in the early fall usually has not made sufficient growth to be grazed until late the following spring.

Experience has thoroughly demonstrated that pastures are most successfully managed when well fenced and divided into a number of fields. This makes it possible to restrict the stock to any inclosure and to change them from one pasture to another as the feed becomes

plentiful or scarce. By changing the stock in this way the grass has a chance to become renewed in growth and freshness.¹

WINTER FEED.

While the climate west of the Cascade Mountains is such that stock may be pastured during practically the entire year, stockmen must count on doing some winter feeding. Hay for the winter may be produced in two ways: (1) The logs, tree tops, and other rubbish left by the fire may be piled and burned and the land seeded to grass. Hay for winter feeding may then be cut from among the stumps. Hay is not infrequently produced in this way by the small farmers until they are able to clear the land of the stumps. (2) Enough land may be entirely cleared and put into cultivation to produce the required winter feed. It is usually possible to find moist, fertile areas of land here and there which may be cleared and used for this purpose.

The necessity of winter feeding may be greatly reduced by providing good winter pasture. This is done by removing the stock early in the summer and allowing the pasture to produce the greatest possible growth of stems and leaves during the late summer and autumn months. When the grasses practically cease growing in the late fall, the stock are turned into the winter pasture to feed upon the growth made during the autumn. This necessitates a subdivision of the pasture. Some prefer to use the newly seeded land for winter grazing. In this case the burned-over area is seeded in the early fall and the pasture is not grazed until a year from the following December. This gives the plants a chance to produce seed during the first summer and to become deeply rooted and well established.²

STOCK TO PASTURE.

There are two important problems which must be taken into consideration in using logged-off land for pasture. The first is to prevent the underbrush, briars, and weeds from occupying the land and crowding out the pasture plants. The second is the difficulty of maintaining the pasture in a productive condition where the stumps and timber are to remain on the land. In deciding the kind of stock to be pastured these two problems should be carefully considered.

The first of these difficulties may be met satisfactorily by the use of Angora goats. By nature these animals are browsers. They thrive on weeds and the leaves, buds, twigs, and bark of brush, a class of

¹ For a further discussion of the management of pastures, see Circular 49, Bureau of Plant Industry, U. S. Dept. of Agriculture, entitled "Improvement of Pastures in Eastern New York and the New England States."

² For a discussion of forage crops that may be grown under cultivation, see Farmers' Bulletin 271, entitled "Forage-Crop Practices in Western Oregon and Western Washington."

vegetation that other domestic animals rarely eat. By their use the underbrush may be either held under control or completely destroyed.

If the primary object in pasturing Angora goats on logged-off land is to kill the underbrush in order to lessen the cost of clearing the land, they are confined to certain areas until the brush is destroyed. This will require from two to five years, depending upon the brush and how closely it is kept browsed. After the brush is killed it takes two to three years more for the roots to decay sufficiently for the land to be plowed. In order to destroy brush uniformly in this way it is often necessary to cut the saplings that are too large to be bent over or ridden down by the goats, for all of the leaves and twigs must be within their reach. After the brush has all been killed it is very probable that some other kind of stock will prove more profitable than Angora goats.

In some instances Angora goats are kept solely for the mohair produced and the increase of the herd. When this is the primary object, instead of clearing the land of the brush, it is desirable to keep the pasture in the best possible condition for goats. In order to do this they are changed from pasture to pasture or given a larger range so that the brush may not be browsed closely enough to be destroyed. If provided with shelter and a good brush pasture, that is, a pasture that was not used during the previous season, Angora goats require very little other feed during the winter. Proper care and suitable feed during the severest weather, however, will keep them more thrifty and increase the quantity and quality of mohair produced.

The second difficulty, that of maintaining the pasture in a productive condition, must be met very largely by carefully guarding against overgrazing and by pasturing the kind of stock that is least severe on the stand of grass. If the pasture is carefully managed, so that the brush will be kept under control instead of being killed, the land may be used as a goat pasture almost indefinitely, for the Angora goat eats very little grass when browse is plentiful.¹

When the land is burned over and seeded as indicated above, a great deal of grass and clover will usually be produced, much more than goats will consume in connection with their browsing. Some other kind of stock may profitably be run with goats to consume this surplus feed. That both sheep and horses are more severe on pasture than cattle is well known. For this reason cattle as a class are the most satisfactory stock to pasture with Angora goats on logged-off pasture land. The rapidity with which the population of the Pacific Northwest has increased during the last decade has built up a strong demand for both beef and dairy products, especially the latter. The

¹ For a fuller discussion of the care and management of the Angora goat, see Farmers' Bulletin 137, entitled "The Angora Goat;" also Bulletin 78, of the Washington State College, Pullman, Wash., entitled "The Goat Industry in Western Washington."

State of Washington is importing approximately \$7,000,000 worth of dairy products per annum. In addition to the shortage in the production of dairy products in both Oregon and Washington, there is also a corresponding shortage in good dairy cows. There are few localities where dairy cows and dairy products can be produced more cheaply than in that portion of Oregon and Washington lying west of the Cascade Mountains. The moist, mild climate of this region makes it possible to graze cattle during the greater portion of the year, and there is no reason why the logged-off lands of western Oregon and western Washington may not be used successfully in this way.

SUMMARY.

There are approximately 3,000,000 acres of unimproved logged-off land in western Oregon and western Washington. The area of such land is increasing very rapidly.

Much of the logged-off land in both Oregon and Washington is well adapted to cultivation. Some of it is rough and should be reforested.

Owing to the high cost of removing the stumps it will be many years before the bulk of this land will be cleared and brought under cultivation. If allowed to lie unused the land usually produces a dense growth of underbrush and young trees. In this way the cost of clearing the land increases from year to year. (See figs. 1, 2, and 4.)

The moist, mild climate of western Oregon and western Washington is admirably adapted to the growth of pasture forage, and stock may be grazed during most of the year.

The underbrush may be kept under control or destroyed by properly utilizing these lands for pasture. When the brush is killed by the use of Angora goats, the cost of clearing the land is materially reduced. This is clearly shown in figures 1 and 2.

The use of logged-off land for Angora-goat pasture is a great protection against forest fires. This is also shown in figures 1 and 2.

Logged-off land is profitably used for pasture as follows:

(1) The land is burned over as completely as possible during August or early September, when everything is dry.

(2) Good stands of grass are obtained by sowing the seed in the loose ashes before the fall rains begin. (See fig. 5.)

(3) The pasture is divided into several fields in order that the stock may be shifted from one inclosure to another as the feed becomes scarce or plentiful.

(4) Winter pasture is provided by removing the stock from an inclosure in early summer. In the late fall the stock is turned in to graze upon the forage produced during the late summer and autumn. A good winter pasture lessens the necessity for winter feeding.

(5) Because of the difficulty of renewing or improving the stand of grass, owing to the stumps and tree tops remaining on the land, it is necessary to guard carefully against overgrazing.

(6) Because of the underbrush that persists in growing on uncleared land and because they feed largely on browse, Angora goats should be widely used on logged-off pasture land either to control or to kill the brush.

(7) When the land is properly burned over and seeded, more forage should be produced than the goats can consume in addition to their browsing. Some other kind of stock should be run with the goats to consume this surplus feed. Cattle are most satisfactory for this purpose.

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